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AUTHORITY

USAFLC ltr, 4 Jun 1980

DEPARTMENT OF DEFENSE

Materiel Distribution System Study

Volume I.
Executive Summary.

PREPARED FOR THE
JOINT LOGISTICS COMMANDERS

(9) Final rept. Apr 75 - May 78.

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1 July 1978

Volume I
Executive Summary

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HEADQUARTERS UNITED STATES ARMY
MATERIEL DEVELOPMENT AND READINESS COMMAND
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HEADQUARTERS NAVAL MATERIAL COMMAND
WASHINGTON, DC 20360

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE LOGISTICS COMMAND
WRIGHT-PATTERSON AFB, OHIO 45433

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SYSTEMS COMMAND
ANDREWS AFB, WASHINGTON, DC 20334

JOINT AGREEMENT ON DEPARTMENT OF DEFENSE MATERIEL DISTRIBUTION SYSTEM STUDY

We agree that the Department of Defense Materiel Distribution System (DODMDS) Study Group has fulfilled the Joint Logistics Commanders' (JLC) agreement with OSD, formalized in ASD (I&L) Memorandum, 18 April 1975, Subject: DOD Materiel Distribution Study. We view the data base and recommendations contained in the DODMDS Study Group's Final Report to be innovative and creditable products which should be of significant value to the Office of the Secretary of Defense in making facility consolidation and closure decisions to improve the management of distribution system resources throughout the Department of Defense. The DODMDS Study Final Report should also be an important element of the Defense Resource Management Study (DRMS). We further agree to maintain the DODMDS data base under JLC auspices.

At the request of ASD (MRA&L), we are forwarding an advance, draft copy of the DODMDS Study Group's report to OSD. With the subsequent transmittal to OSD of individual JLC comments on the DODMDS Study Group's report through respective Service Headquarters, this draft copy becomes the DODMDS Final Report.

JOHN R. GUTHRIE
General, USA
Commanding
U.S. Army Materiel Development and Readiness Command

F. H. MICHAELIS
Admiral, USN
Chief of Naval Material
Naval Material Command

BRYCE POE, II
General, USAF
Commander
Air Force Logistics Command

ALTON D. SLAY
General, USAF
Commander
Air Force Systems Command

Date: 5 April 1978

FOREWORD

Transmitted herewith for the Joint Logistics Commanders is the Final Report on the Department of Defense Materiel Distribution System (DODMDS) Study.

This report covers the JLC Control Panel and Working Group efforts during the period April 1975 to March 1978. This effort involved the collection of all DOD supply transactions and cost data; information on the physical facilities that receive, store, process, issue, and ship wholesale materiel; visits to each of the 34 wholesale depots nominated for study; personal interviews with consultants and recognized experts in the field of physical distribution; and the use of two state-of-the-art mathematical models.

The Executive Summary, Volume I, contains the essential elements and findings of the study. The Technical Report, Volume II, and Appendices, Volume III, provide the detailed information and rationale which support the Executive Summary.

JACK W. WATERS
Brigadier General, USAF
Control Panel Chairman

HIGHLIGHTS

* The current DOD Materiel Distribution System (DODMDS) structure comprises 34 facilities indicated below.

* The DODMDS proposed structure reduces to 25 distribution facilities and merges three others.

- o Reduces distribution system costs by approximately $100 million annually.
- o Supports peacetime and mobilization/wartime requirements.
- o Improves responsiveness.
- o Recommends increased use of multimission facilities.

- o Provides for migration of consumable stocks closer to nodes of consumption.

* Eliminates Wholesale Distribution Missions at:

  - o Pueblo Army Depot Activity
  - o Lexington Army Depot Activity
  - o Defense Electronics Supply Center Dayton
  - o Defense Construction Supply Center Columbus

* Identifies preferred options for elimination of wholesale distribution missions at:

  - o Defense General Supply Center Richmond
  - o Defense Depot Ogden
  - o Defense Depot Tracy
  - o Sharpe Army Depot
  - o Defense Depot Memphis[1]

* Recommends merger of management and administration of Navy distribution facilities in Norfolk, Oakland, and San Diego areas.

* Wholesale Distribution Facilities included in proposed DODMDS:

Anniston Army Depot	NAS Jacksonville
Corpus Christi Army Depot	NSC Pearl Harbor
Letterkenny Army Depot	MCAS Cherry Point
New Cumberland Army Depot	Oklahoma City ALC
Red River Army Depot	Ogden ALC
Sacramento Army Depot	Sacramento ALC
Tobyhanna Army Depot	San Antonio ALC
Tooele Army Depot	Warner Robins ALC
NSC Oakland/NAS Alameda	MCLSBLANT Albany
NSC Norfolk/NAS Norfolk	MCLSBPAC Barstow
NSC San Diego/NAS North Island	DDMP Mechanicsburg

---

[1]Decision pertaining to Defense Depot Memphis subject to further on-site analysis at Georgia/Florida depots to determine effects of substantially greater workload on fixed costs at those depots.

* Cost trade-offs between transportation and facility operation do not support separate consumable and reparable item distribution systems.

* Substantial gains from consolidation of storage appear limited to large end items and items too bulky for palletizing.

* Ownership of facilities retaining a distribution mission continues with existing Service or Agency as at present. Ownership of materiel remains with the inventory manager.

* No investment proposed for options recommended. After final decisions on options, Services/DLA/OSD can evaluate the economic advantages of future renovation/MILCON on a depot-by-depot basis.

* Implementation Occurs in Three Phases:

  o Phase I (1 Apr - 31 Jul 78)

    - Services/DLA review completed study.

    - List of candidate facilities finalized.

    - Joint Steering Group established.

  o Phase II (1 Aug 78 - 28 Feb 79)

    - SECDEF announces candidate facilities.

    - Detailed impact studies/assessments conducted.

    - Services/DLA finalize selection of facilities for closure/mission change.

  o Phase III (1 Mar 79 - 31 July 82)

    - SECDEF decision announcement.

    - Congressional review.

    - Implementation of DODMDS realignment actions begins.

- Noteworthy Features of the Existing DODMDS:
  - o Most distribution facilities in the DOD are located near significant demand concentrations.
  - o Maintenance plays a significant role in the distribution system as a consumer and source of supply.
  - o The DODMDS maintains a high percentage of inactive stock.
  - o Although the commodity mix in the DODMDS was varied and complex, 97 percent of the DOD items which had movement in the base year were under 50 pounds in unit weight; 76 percent had a unit weight of one pound or less.
  - o Subsistence and direct commissary support items account for the largest volume of weight of any commodity moving in the system (over 25 percent).
- Some Final Thoughts:
  - o Additional improvements in DOD logistics may be possible through a comprehensive evaluation of depot maintenance missions and logistics management information systems.
  - o Study did not assume a reduction of total variable cost in DODMDS in spite of the potential for reduction through managerial innovation at existing distribution centers. Further savings are considered possible through evolutionary application of automation/personnel trade-offs. (See Epilogue)

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FOUNDATION OF THE STUDY

CHAPTER 1

FOUNDATION OF THE STUDY

A. THE DOD MATERIEL DISTRIBUTION SYSTEM IN PERSPECTIVE

Military logistics is big business by any measure. Wholesale materiel distribution operations accounted for approximately $1.0 billion in FY 1975. Its activities encompassed five distribution systems operated by the Army, Navy, Air Force, Marine Corps, and the Defense Logistics Agency with policy guidance and coordination provided by the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics).

B. REASON FOR THE STUDY

In the face of escalating costs and the continued need for a responsive military posture, the efficient use of resources to support and maintain the military forces is of continuing concern at all levels. Recent advancements in computer capabilities and mathematical modeling offered, for the first time, the necessary tools and techniques for the Joint Logistics Commanders (JLC), USMC and DLA to view the five distribution systems analytically as a single entity. At the 1975 DOD Logistics Symposium held at Airlie House near Washington, DC, an understanding was reached that the JLC would undertake a study of the wholesale DOD Materiel Distribution System (DODMDS) with the objective of recommending specific actions, time frames, and resources required to improve it. A Charter and Study Plan were drawn up and the study was officially begun on 1 April 1975.

C. OBJECTIVES AND SCOPE

1. Objectives

The objectives of the study were to conduct an examination of the current DOD Materiel Distribution System (DODMDS) and

recommend improvements which would support the Services' operational readiness requirements effectively and economically in peace and under mobilization/wartime.

More specifically, the study objectives called for a time-phased, priced-out implementation plan to determine: (a) what facilities were required and their intended missions, (b) actions required to transition from existing facilities to recommended facilities, (c) activity closures and/or moves, and (d) military construction projects required, if any.

2. Scope

The DODMDS study embraced the wholesale distribution processes involved at the major wholesale activities operated by the Army, Navy, Air Force, Marine Corps and the Defense Logistics Agency within the 50 states (See Figure 1). More specifically, it included: (a) the sources of materiel delivered to the distribution system, (b) the location and operation of the distribution facilities, (c) the customers served by the system, and (d) the transportation links, both commercial and government, that connect the sources of supply, the distribution facilities, and the customers, including overseas customers.

Certain commodities were excluded from the study because of their unique characteristics. Commodities excluded were: bulk petroleum, ammunition, chemical/biological/radiological items, perishable subsistence, industrial plant equipment, and some major end items, i.e., aircraft, ships, strategic missiles. Distribution facilities excluded were those located outside the 50 states as well as certain specialized facilities devoted primarily to ammunition storage and Navy fleet ballistic missile submarine support. Maintenance and inventory control missions were not evaluated as part of this study; however, maintenance was treated both as a customer and as a source of supply (reparables) to the distribution system.

ARMY DEPOTS	NAVY DEPOTS	AIR FORCE DEPOTS
Anniston AD	NAS Alameda	Oklahoma City ALC
Corpus Christi AD	NAS Jacksonville	Ogden ALC
Letterkenny AD	NAS Norfolk	Sacramento ALC
Lexington*	NAS North Island	San Antonio ALC
New Cumberland AD	NSC Norfolk	Warner Robins ALC
Pueblo*	NSC Oakland	
Red River AD	NSC Pearl Harbor	
Sacramento AD	NSC San Diego	
Sharpe AD	MCAS Cherry Point	
Tobyhanna AD		
Tooele AD		

MARINE CORPS DEPOTS	DLA DEPOTS
MCLSBLANT Albany	DCSC Columbus
MCLSBPAC Barstow	DDMP Mechanicsburg
	DDMT Memphis
	DDOU Ogden
	DDTC Tracy
	DESC Dayton
	DGSC Richmond

* Depot Activity

Figure 1. DISTRIBUTION FACILITIES UNDER STUDY

D. ORGANIZATION OF THE STUDY

The DODMDS study took place in three phases: Phase I was concerned with Charter and Study Plan development; Phase II was devoted to obtaining the required personnel resources and initial research; and Phase III, which began in December 1975, launched the full study effort involving data definition and collection, modeling, analysis, and development of preferred options.

The study effort was conducted by a Working Group of military and DOD civilian personnel reporting to a Flag Level Control Panel with representatives from the Logistical Commands, USMC, DLA, and the OSD for overall management and guidance (Figure 2). The Working Group was further assisted by recognized professional consultants in the fields of logistics, statistics, computer programming and mathematical modeling. Part-time assistance was also rendered by the Naval Post Graduate School, Air Force Institute of Technology, Military Airlift Command, Military Sealift Command and the Military Traffic Management Command. In summary, expert advice and guidance, both inside and outside of DOD, were eagerly sought, readily available, and materially beneficial.

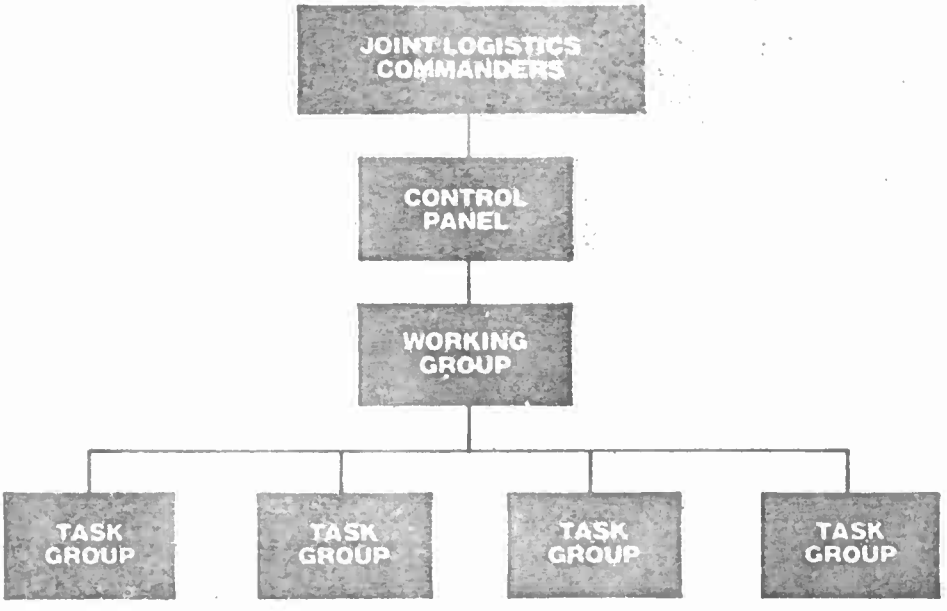

Figure 2. ORGANIZATION

Chapter 2

THE DOD MATERIEL DISTRIBUTION SYSTEM DEFINED

CHAPTER 2

THE DOD MATERIEL DISTRIBUTION SYSTEM DEFINED

A. INTRODUCTION

The DOD Materiel Distribution System (DODMDS) comprises wholesale materiel movements from sources to customers across a variety of transportation links and intermediate storage facilities. To conduct an analysis of this system required collection and appraisal of logistics data. Three quarters of FY 75 and one quarter FY 76 were used as the base year. This chapter summarizes major findings about customers and their demand, supply sources, distribution facilities, transportation links, unique features and system insights gained.

B. CUSTOMERS

The DOD distribution system exists for one purpose -- to provide effective support to customers. These customers represent the military services, the U.S. Coast Guard, other DOD and government agencies, defense contractors, and friendly foreign governments. Over 50,000 different activities were identified as worldwide DODMDS customers.

C. DEMAND

Total materiel demand placed on the 34 distribution facilities by DODMDS customers resulted in 27.4 million wholesale issues. Significantly, 27 of the Service and DLA wholesale distribution facilities were in geographic regions where 3/4 of the total demand transactions and weight originated (allowing air and waterport gateways to represent overseas demand), see Figure 3. Summary of demand data:

19.8 million wholesale issues to CONUS customers.

7.6 million wholesale issues to overseas customers.

$24.3 billion value of wholesale issues.

D. SOURCES

During the baseline period, the Services and DLA distribution facilities received materiel from both procurement and non-procurement sources. Non-procurement receipts included materiel returned from customers, largely reparables, and repaired items from maintenance sources. Summary of materiel receipt data:

1.9 million procurement receipt transactions.

$6.6 billion value of procurement receipts.

19,000 procurement sources in baseline period.

3.8 million non-procurement receipt transactions.

$16.5 billion value of non-procurement receipts.

E. COMMODITIES

There were 4.1 million different items (national stock numbers) identified in the Federal Catalog System in the base period; 3.7 million were managed by the Services and DLA. The 27.4 million issue transactions during the base period occurred on just 1.6 million items of the total 3.7 million managed by the Services and DLA. The remaining 2.1 million items had no issue activity in the wholesale system.

F. DISTRIBUTION FACILITIES

The 34 wholesale distribution facilities included in the DODMDS study were identified on Figure 1, Chapter 1. From Figure 3, it can be seen that, for the most part, these facilities are dispersed across the southern and littoral regions of the United States where a large share of the customer demand was and continues to be located. There is significant clustering of facilities in several regions. A summary of the characteristics of the 34 facilities follows:

1. A total of 886 buildings were used for receipt, storage, issue and materiel processing.

2. While many of these buildings exceeded their designated economic life, they were, in general, quite serviceable for the storage mission of DODMDS. Most of them are still in satisfactory condition.

3. Total covered storage space: 102.9 million square feet; 785 million cubic feet.

4. Many of these distribution centers had excellent processing facilities. All of the ALC's and several Army and DLA depots have recently made significant investments in improved automated processing systems.

Figure 3. DISTRIBUTION FACILITIES AND DEMAND CONCENTRATIONS

G. TRANSPORTATION LINKS

Transportation is the circulatory system of the DODMDS. It links together the commodity movements among the customers, sources, and distribution facilities. It is accomplished using a variety of modes and services, both military and commercial. All facilities were located on or in close proximity to main highway networks and rail lines (except Pearl Harbor). Twenty-six facilities were located within 15 miles of a C-5 capable airfield (two served as aerial ports of embarkation). Seven were at tidewater locations.

H. UNIQUE FEATURES

1. The majority of wholesale distribution facilities were located on multimission complexes with maintenance the most dominant additional large-scale activity. The Air Logistics Centers, for example, had large maintenance and operational flying activities collocated with distribution. The multimission character of such installations permits the added benefit of overhead sharing. These collocated distribution facilities made 8.4 million retail issues to local area customers.

2. Large, multimission complexes are major employers in their state or locale.

3. The DODMDS was not characterized by high line item issue activity compared to some large organizations in the private sector.

4. The DODMDS was characterized by its complexity, a wide and unusual mix of commodities and tonnages, and a priority system that differentiated it from industry. The DODMDS received, processed, stored, and issued all conceivable commodity mixes such as drugs, transistors, ball bearings, chemicals, food, clothing, weapons, vehicles, and large engines.

5. The DODMDS maintained a high percentage of inactive and slow moving stock in storage compared to the private sector. DOD had a systemwide inventory turnover rate of 0.7 turns yearly.

6. Maintenance played a significant role affecting the DODMDS as both a customer and a source of supply (reparables).

Nearly 25 percent of all issue transactions (1/3 of the tonnage) went to customers collocated with the wholesale distribution facility.

7. Customer returns, both serviceable and unserviceable, complicate the distribution system. These items move in small lots requiring numerous processing actions and added costs. They impose a significant amount of workload on the distribution system.

8. Mobilization requirements were a unique feature of the DODMDS due to the requirement to change rapidly from a peacetime posture to a mobilization/wartime footing. Consumption rates differ by commodity in both peacetime and under mobilization; slow-moving or non-moving items in peacetime become fast-movers in war. Also, some commodities will bypass the distribution facility in wartime and go direct to the consumer. The factors used for predicting mobilization/wartime workload are covered in Chapter 3, Tools for Analysis, Executive Summary.

I. BASELINE SYSTEM INSIGHTS

1. The DODMDS had excess processing capacity in the base period; with no additional investment, the 34 distribution facilities had an issue capacity of about 200,000 lines in an eight-hour day compared to an average workload of 75,000 wholesale issues daily.

2. Ninety-seven percent of the DOD items which moved in the base year were under 50 pounds in unit weight; 76 percent had a unit weight of one pound or less.

3. One-third of the wholesale tonnage moved to overseas customers; another third went to customers in the immediate proximity of the sites where the 34 distribution facilities were located; another third to all other CONUS customers.

4. Subsistence and direct commissary support items accounted for over 25 percent of the total weight moving in the DODMDS.

5. Sixty-seven percent of the total DOD tonnage shipped from DODMDS distribution centers moved by commercial truck/rail modes in the base year.

6. The Air Force and Navy used expedited modes (air predominantly) to a much greater extent than the other Services/DLA. LOGAIR/QUICKTRANS moved 3.8 percent of the total weight with a systemwide mean of 2.8 days transit time (median, 2 days; mode, 1 day).

7. Distribution Facility Operating Costs. A major focus of attention in the DODMDS study was the development of operating costs for the 34 distribution facilities. The effort was complicated by the fact that the DODMDS is composed of not one but five distinct subsystems (Army, Navy, Air Force, Marine Corps, and DLA). The reported cost of operation of each distribution facility was a function of the non-comparable distribution missions as well as the commodity mix and volume at each depot. In addition, Service-operated distribution facilities included retail operations in support of local customers as part of their materiel distribution mission. Figure 4 depicts the total distribution facility costs related to the materiel distribution mission (including retail operations) by Service/Agency for the DODMDS base period.

Army	160.5
Navy	96.5
Air Force	128.6
USMC	28.6
DLA	155.9
Total	$570.1M

Figure 4.

BASE PERIOD TOTAL MATERIEL DISTRIBUTION FACILITY COSTS

8. Transportation Costs. The base period transportation costs, inbound and outbound, by Service and DLA (wholesale only), are summarized in Figures 5 and 6. Interdepot transfers of materiel were excluded.

	New Procurement Transportation Cost	Non-Procurement Transportation Cost
Army	19.2	57.5
AF	5.5	35.3
Navy	17.3	15.9
USMC	2.2	4.7
DLA	70.0	15.3
	114.2	128.7

Figure 5. INBOUND TRANSPORTATION COSTS ($ MILLIONS)

	Transportation Cost
Army	87.8
AF	37.0
Navy	44.4
USMC	8.7
DLA	153.2
	331.1

Figure 6. OUTBOUND TRANSPORTATION COSTS ($ MILLIONS)

Cost Summary

The DODMDS base year cost was the aggregate of $570 million for distribution facility operations (wholesale and retail) and $574 million for transportation (wholesale only).

J. SUMMARY CONCLUSIONS REGARDING THE BASELINE DATA

A review of the elements which constitute the DODMDS, their magnitude during the base period, and insights gained led to several conclusions.

1. The DODMDS had excess capacity for peacetime logistics support.

2. Twenty-seven Service and DLA distribution facilities were located in regions where 3/4 of the demand was generated (allowing air and water port gateways to represent overseas demand).

3. The majority of distribution facilities were located on multimission complexes which represented a significant amount of the total DODMDS demand.

4. The above summary conclusions indicated that major savings might be possible through closures and by positioning certain categories of materiel closer to customers. The modeling analysis subsequently supported this conclusion.

Chapter 3

TOOLS FOR ANALYSIS

CHAPTER 3

TOOLS FOR ANALYSIS

A. STUDY APPROACH

The basic question addressed by the study was, "What form should the DODMDS of the future take?" To propose a system for the future required an examination of the many variables affecting the system: commodities, distribution facility locations and associated costs, sources of materiel, customers, and transportation links. The largest task was to collect, validate, and summarize the DOD logistics system data. Assimilating and digesting this unprecedented volume of information for analytical purposes required computerized modeling techniques.

B. MODELING

Two existing models were selected and enhanced for this unique distribution problem:

1. A Mixed Integer Linear Programming Model. This model is designed to minimize system operating cost through an evaluation of depot costs and transportation costs. This model is referred to as the optimization model. Over 250 alternative model scenarios were run. Major modeling strategies used were: replication of the base year system (to compare with future alternatives), realigned present system without allowing depot closures (allowed customer and stockage pattern shifts), realigned system allowing depots free to remain open or close, realigned system treating various levels of depot investment/ modernization, and evaluation of selected commodity reassignments.

2. A Dynamic Simulation Model. This model is designed to evaluate system and individual distribution facility operating capacity and responsiveness. This model was used to evaluate

the more promising system structure alternatives suggested by the optimization model. This model is dynamic in that it represents data as time sensitive; it evaluates system performance by analyzing demands on the proposed distribution system on a daily basis.

3. Validation of Models. The two models chosen for the DODMDS study have been used successfully in commercial distribution studies. After their modification to accommodate the DOD distribution problem, they were subjected to mathematical testing and authentication, and finally validated using sets of test data. Both models stood up well under the several validation checks and were considered to be completely reliable for modeling the DODMDS problem.

C. DATA STRUCTURING

To organize the data collected required certain specific actions and techniques. This was essential to the analytical effort.

1. Aggregation. Although computer modeling provided the means to effectively assimilate a large matrix of variables, the enormous size and complexity of the DODMDS required a reduction in the data mass. This aggregation was accomplished through various statistical techniques and resulted in an aggregated data base as indicated below:

a. Commodities. The 3.7 million items managed by the Services and DLA were aggregated into 72 basic product groups (Appendix A lists the 72 DODMDS product groups). Three of the 72 product groups contained ammunition and nuclear ordnance which were excluded from study; this left 69 DODMDS product groups. Although the DODMDS optimization model had capabilities far beyond any other known software package, it was still not capable of evaluating all possible depot/product/customer combinations in any one model run. Further aggregation or "bundling" was required. The objective of this procedure was to group the 69 DODMDS products into a smaller set of bundles capable of evaluation by the optimization model. Grouping was based on similarity of handling and storage characteristics as well as major commodity categories, e.g., all aircraft items, all automotive, etc. The final structure was a set of 27 bundles (see Appendix B). By using a 27-bundle strategy, all facilities were permitted to compete for all bundles (when not specifically excluded because

of a facility's physical capability - e.g., tanks were not allowed to be stocked at Pearl Harbor) for all customers.

b. Customers. The 50,000 different customer activities were aggregated to 205 customer demand nodes.

c. Supply Sources. The 19,000 procurement sources were aggregated to 142 DODMDS procurement zones. Additionally, the 205 customer nodes served as non-procurement sources of supply, i.e., serviceable and unserviceable item returns.

2. Depot Costs (Distribution Facility Operations Cost).

a. For this study, depot costs were categorized as either fixed or variable. Fixed costs were defined as those elements of cost which did not directly relate to materiel distribution workload, e.g., facilities management, ADP, and vehicle services. Variable costs were defined as those costs directly related to materiel distribution workload. Figure 7 displays the total (wholesale and retail) variable and fixed costs by Service/DLA. Because of wide differences in depot size, management policies, mission, and other unique characteristics, a systemwide standard variable cost by DODMDS product was developed for modeling purposes.

	Variable Cost	Fixed Cost	Total Cost
Army	110.9	49.6	160.5
Navy	63.7	32.8	96.5
Air Force	106.6	22.0	128.6
USMC	16.2	12.4	28.6
DLA	108.1	47.8	155.9
Total	405.5	164.6	570.1

Figure 7. COMPONENTS OF TOTAL DEPOT COSTS ($ MILLIONS)

b. The development of depot costs for DODMDS study purposes was a complex problem due to the organizational and mission differences among the facilities. The single most important factor contributing to fixed cost differences was the location of distribution facilities on multimission complexes. The two major impacts of collocated facilities on costs were:

(1) Additional supply functions over and above basic materiel distribution tasks, e.g., bulk fuel operations, customer service stores, troop support operations, etc. Costs for these functions were excluded from distribution depot cost development.

(2) Additional materiel distribution workload in support of retail (local) customers. A split of depot costs between those applicable to wholesale versus retail materiel distribution was required for modeling analysis.

c. Commodity Difficulty Factors. The depot variable cost per hundredweight (CWT) was not equal for all commodities. To reflect this difference, a difficulty factor was developed for each of the DODMDS commodities. Refer to Chapter 4, Volume II, Technical Report, for a detailed discussion on difficulty factor development.

d. Economies of Scale. The historical distribution facilities variable costs did not reflect economies of scale. Therefore, an investigation into the potential for achieving economies of scale was undertaken. An analysis of state-of-the-art and forecasted (1986) technologies in materials handling equipment and facilities revealed quantifiable differences in the handling and storage costs of certain categories of materiel. These relationships are illustrated in Figure 8 below. Unit costs in dollars/CWT represent the basic "hands-on" receipt, storage, and issue functional costs and were made up of labor, supplies, and annualized investment in space and equipment. Wholesale throughput, in CWT, is expressed as Number of Distribution Centers; i.e., from one depot having the total DODMDS throughput for that materiel category to 40 depots, each having 1/40 the total DODMDS throughput. Large items and vehicles present the greatest potential savings through consolidation permitting better utilization of labor, equipment and space. Subsistence and small items generally use more conventional handling and storage concepts and therefore incur lower initial costs at low throughput levels. Substantial labor savings through mechanization were not found to exist for either subsistence or small items categories, even at the higher levels of DODMDS throughput. The ratio of unit-cost/CWT at 40 distribution centers versus unit-cost/CWT at one distribution center for vehicles and large items was 2.5 while for small items and subsistence the ratios were 1.2 and 1.5 respectively (see Figure 8). These ratios did not change significantly using forecasted 1986 unit costs.

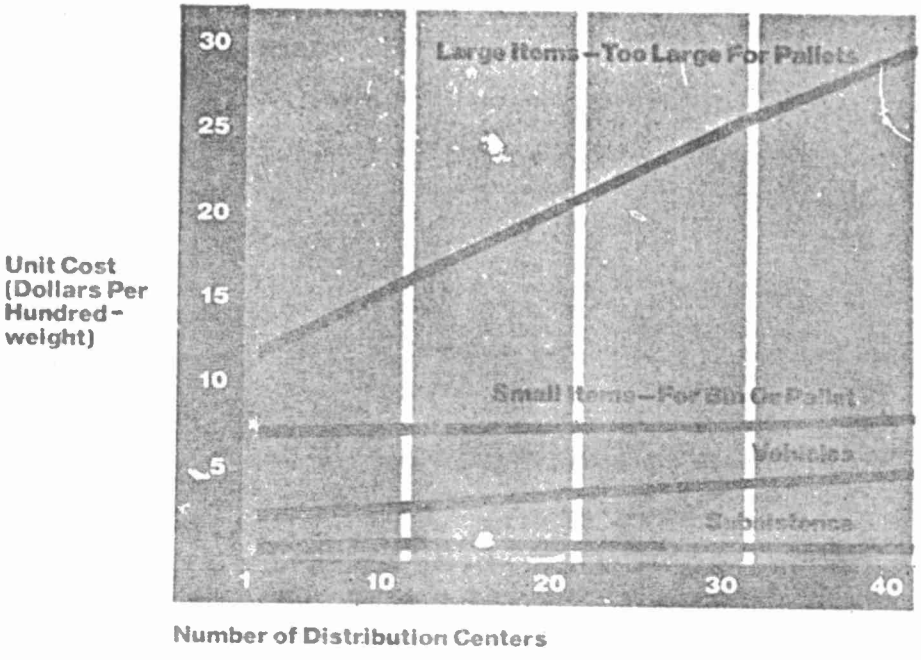

Figure 8. UNIT COST/THROUGHPUT RELATIONSHIPS

3. Capacity. The capacity of a distribution facility was viewed from two aspects: Capacity as it applied to storage and capacity as it applied to the dynamics of daily processing. Chapter 4, Volume II, Technical Report, explains in greater detail the methodology for determining capacity.

a. The optimization model throughputs were used to assess the facility storage capacity against proposed commodity assignments for each distribution facility.

b. The simulation model assessed the daily throughput capacity of each distribution facility. This capacity was defined as the maximum number of line items and CWT which a distribution facility could process and offer for shipment during an eight-hour day without investment in additional equipment or facilities.

4. Transportation Costs.

a. To derive transportation costs for the modeling effort, transportation rates were required over three sets of links: inbound to the distribution center from procurement, inbound from customers (customer returns), and outbound from distribution facilities to customers. The rates developed for these links represented the composite mix of freight classifications, shipment unit weights, and mode compositions found on each of the more than one million links. These weighted rates were expressed in terms of dollars per hundredweight ($/CWT) for each product group to each DODMDS customer and allowed transportation costs to be computed for any commodity or group of commodities moving over any link in the DODMDS defined structure.

b. A transportation rate forecast was also developed for the study. For a further elaboration on the DODMDS transportation rate development see Chapter 4, Volume II, Technical Report.

5. Performance. System performance characteristics from the base year were developed to analyze responsiveness of the different options considered to insure no degradation of customer support.

6. Depot Clustering for Analysis. It was discovered early in the modeling phase that because of the very close proximity of some facilities, it was impossible for the model to discriminate among them based on transportation costs alone. Further, in areas where several depots were close together, and the total capacity of all the depots in the area exceeded requirements, it was desirable to look at options off-line. This meant that the model should be used to determine the location economics by area, leaving to off-line analysis the evaluation of combinations of depots to meet the workload requirements. The technique developed to overcome these problems was "cluster analysis". This technique grouped the 34 DODMDS distribution facilities into 15 geographically oriented clusters of from one to six distribution facilities each (see Appendix C, Executive Summary). Each cluster was then viewed as one facility with the summed capacity and fixed costs of all facilities in the cluster. Model runs were then made evaluating the 15 cluster locations. The location economics of the flows in the system were allowed to determine which clusters should provide which products to which customers.

This, in effect, was a macro-picture of the natural location economics of the DODMDS. These macro-level solutions were then subjected to in-depth off-line analysis to determine if the model assignments of customers and commodities to clusters made good logistics sense.

D. SPECIAL CONSIDERATION

Maintenance Interface. An area of special concern was the representation of system costs resulting from optimization modeling of reparable product flows which differed from historic distribution/maintenance interfaces. There were no additional system costs introduced if the optimization model retained the historic reparable product flows between collocated distribution and maintenance activities. However, new system costs were incurred where the optimization model elected to locate reparable products away from historic maintenance sites. Maintenance was dependent upon the collocated distribution activity for receipt, storage, and issue of reparable products. Since these products must continue to be handled at the historic maintenance sites, a means for representing the distribution handling of reparables at collocated sites had to be devised. Therefore, a maintenance interface penalty charge had to be imposed in those cases where the optimization model elected to relocate the storage of reparables away from their historic maintenance sites. A more detailed explanation can be found in Chapter 4, Volume II, Technical Report.

E. SCENARIOS FOR MODELING

1. Sensitivity Analysis. Important to any modeling assisted study is the need to conduct sensitivity analyses of the key independent variables affecting the system. The more significant scenarios tested for sensitivity were shifts in demand and demand level changes, alternate transportation rates, depot wage grade differentials, supply source shifts, and mobilization. The sensitivity analyses of these scenarios are summarized in Chapter 4, Analysis and Findings, Executive Summary.

2. Mobilization. To project the mobilization/wartime workload on the DODMDS, an analysis was conducted on each of the DODMDS product groups. Several factoring techniques were considered. The one finally adopted consisted of factors developed from Army mobilization requirements data to reflect

increased workload on the distribution facilities. These factors were found acceptable to the Logistical Commands of the other Services. Appendix D, Executive Summary, lists the DODMDS wartime workload factors.

3. Nominal Distribution Facilities. The nominal distribution facility (sometimes referred to as nominal depot) scenario postulated the replacement of existing direct "hands-on" receipt, storage and issue materiel processing procedures, equipment, and warehouses with state-of-the-art (FY 76) and forecasted (FY 86) technologies, materials handling equipment and facilities. Nominal depot modeling outputs and subsequent analysis provided estimates of the annual operational savings which could be realized, when compared to Baseline System costs, with unlimited capital investment.

4. Separate Consumable and Reparable Distribution System Concept. These analyses were made to determine whether concentrating the distribution of consumables in a few depots would be advantageous.

F. LIMITATIONS

Before proceeding to the analytical efforts, it would be appropriate to acknowledge those limitations recognized during the study effort.

1. Aggregations. To conduct a study of these dimensions required an aggregation of its component parts. Large-scale studies have frequently been criticized for aggregating a problem out of existence and unwittingly biasing the results through the aggregation process. To avoid this as much as possible, major military activities within the CONUS were retained as discrete customers, and the study findings have been presented in a manner to permit flexibility in considering specific items and customers, e.g., reparable items have a special coding.

2. Age of the Data Base. The DODMDS data represent actual transactions in a 12-month period during FY 1975-76. A system such as DODMDS continually changes; however, the essential factors which drive the system, customer demand and supply source patterns, remain essentially stable. The data base should thus be representative of the essential elements of the DODMDS for years to come.

3. Distribution Facility Cost. For DODMDS study purposes, the DOD cost accounting structure for distribution facilities had limitations due to the variety of organizations, missions, and reporting systems associated with materiel distribution. This situation required detailed techniques for distilling comparable costs from the costs reported in accordance with DODI 7220.17.

4. Difficulty Factors. No single measure was appropriate for developing depot workload. The historical commodity mix affects the measurement of facility workload in terms of items processed, weight, cube, or dollar value. The difficulty factor was used to recognize the differences among commodities and to convert distribution facility cost by function to depot cost per CWT per commodity for model analysis.

5. Models. Models may approach but seldom replicate reality, particularly where the human factor is dominant. Models were used only as a tool for analysis - but a very powerful and versatile tool. The dominant analysis technique was ultimately one of using technically qualified people with guidance and review by the Logistical Commands.

6. Economic Analysis. While the conclusions presented are specific and relate to real savings in personnel, transportation and facility costs, it will still be necessary to review in a more detailed way the savings proposed. One-time costs associated with personnel dislocations and inactive asset relocation were estimates.

7. Quality of Data. The study found the data furnished by the various agencies was far from perfect with many omissions and inaccuracies. The steps taken to make the data better have been documented. In many cases it was necessary to use "plugged" weight, cube and/or price values, to represent the class or commodity involved. The rationale for deriving these plugged values is described in Appendix D-1, Volume III. On balance, the data base developed and used in the study was the best available and is considered reasonably accurate although some errors undoubtedly remain.

Chapter 4

ANALYSIS AND FINDINGS

CHAPTER 4

ANALYSIS AND FINDINGS

A. INTRODUCTION

Analysis of the DODMDS involved several steps. First, a macro-analysis of the system was made which encompassed the optimization model assessment of the 15 distribution facility clusters (see Appendix C, Executive Summary). The second step was the micro-analysis of the modeling results to refine flows and mission assignments to conform to good logistics sense as well as pure location economics. Finally, intracluster analysis evaluated the results from the first two steps. Sensitivity analysis, referred to in the preceding chapter, was accomplished during the macro-analysis phase. This chapter highlights the measures of merit used to evaluate the many elements of the DODMDS, cluster analysis, sensitivity analysis, intracluster analysis, and summarizes the findings.

B. MEASURES OF MERIT

Measures of merit provide a framework for evaluating system structure alternatives, both quantitative and non-quantitative. Those factors considered most significant follow:

1. Total system cost.

2. Responsiveness (facility processing and transportation).

3. Mobilization flexibility.

4. Facilities in terms of condition and transportation proximity.

5. Interfaces required by maintenance support and Service/DLA uniques (refer to Chapter 2, Volume II, Technical Report for discussion of Services'/DLA unique requirements).

C. CLUSTER ANALYSIS RESULTS:

1. The modeling analysis revealed that distribution facilities at Pueblo, Memphis, Lexington, Dayton and Columbus should be closed based on the trade-off evaluation of transportation costs and the base year facility fixed costs. Further, the cluster analysis revealed that some reduction of depots in Northern California, Utah and Virginia is required to bring depot capacity into line with support patterns in those regions. Model results indicated potential annual operating savings of approximately $100 million for the proposed cluster system over the modeling baseline. These savings were distributed as shown in Figure 9.

	Model Baseline	Proposed Cluster System	Difference
Inbound Transportation*	242.9	262.7	+ 19.8
Outbound Transportation*	331.1	253.2	- 77.9
Facility Operation*	430.3	387.2	- 43.1
	1004.3	903.1	-101.2

*Includes wholesale costs only.

Figure 9. COST RECAP ($ MILLIONS)

Figure 10 summarizes the results of the modeling analysis in terms of the weight flowing through each cluster in the base year and as it would flow in the proposed system (called the Refined System).

2. Distribution facility clusters in the Northern California, Utah and Virginia areas posed unique problems in determining which facilities should be candidates for closure. In each of these clusters, facilities were possible candidates for closure based on workload, fixed costs and capacity factors in that cluster. The facilities affected in these clusters will be addressed in the discussion on intracluster analysis. Figure 11 shows cluster results based on model runs.

Cluster	Baseline	Proposed	% Change
1 No. California	622	570	- 8
2 So. California	124	192	+ 55
3 Virginia	318	289	- 9
4 Pennsylvania	785	849	+ 8
5 Utah	251	198	- 21
6 Lexington	13	-0-	- 100
7 Anniston	211	207	- 2
8 Georgia/Florida	78	257	+ 229
9 Texas	82	187	+ 128
10 Red River	154	186	+ 21
11 Pueblo	33	-0-	- 100
12 Pearl Harbor	12	12	-0-
13 Memphis	285	-0-	- 100
14 Oklahoma City	65	157	+ 142
15 Ohio	71	-0-	- 100
TOTAL	3104	3104	

Figure 10. PROPOSED SYSTEM VS BASELINE (MILLION LBS)

D. SENSITIVITY ANALYSIS

Sensitivity analysis involved a series of model runs to test the sensitivity of the least-cost system structure to several variables, i.e., demand shifts, changes to demand levels, wage rate differentials, transportation rate changes, shifts in sources of supply and an evaluation of the mobilization workload projected by the mobilization workload factors. It was found in each instance the system structure was not significantly altered as a result of substantial changes in these key variables.

1. Summary of the major sensitivity scenarios tested:

Scenario #1 - Demand Shift. The U.S. Army's 2nd Infantry Division moved to CONUS from Korea and all former Southeast Asia customer demand (FMS, etc.) shifted to Middle East.

Scenario #2 - Demand Shift. Same as Scenario #1 but additionally shifted 1/2 of all US Forces in Northern Europe to CONUS.

Figure 11. CLUSTER ANALYSIS RESULTS

Note. Cluster number shown at left of cluster; shaded cluster indicates closed; number shown in parenthesis denotes number of possible facility closures - subject to intracluster analysis.

Scenario #3 - Transportation Rate Increase. Increased rates by 50 percent; tested impact of a higher inflation in transportation costs than other costs.

Scenario #4 - Transportation Rate Decrease. Reduced outbound transportation rates by 40 percent; tested for impact of Section 22 rates.

Scenario #5 - Procurement Source Supply Shift. Moved 1/2 of new materiel availability from supply sources in the Northeast USA to Florida as a supply source.

Scenario #6 - Mobilization. Mobilization workload factors (Appendix D) by DODMDS product group applied to demand.

Scenario #7 - Decrease in Demand. Demand, systemwide, reduced by 20 percent.

Scenario #8 - Local Area Wage Rate Differentials. Adjusted standard variable costs to reflect wage differentials by geographic area for blue-collar workers.

Scenario #9 - Revised Fixed Cost. Computed revised set of depot fixed costs to reflect different allocation assumptions.

Scenario #10 - Maintenance Shifts. Moved demand and supply associated with selected maintenance depots to other depot maintenance locations.

2. Results of Sensitivity Analysis Runs are shown in Figure 12.

E. PERFORMANCE EVALUATION OF REFINED SYSTEM

The Refined System was evaluated by the simulation model to determine how well it would hold up under the dynamics of day-to-day fluctuations in workload, both in peacetime and under mobilization conditions. It was found that the Refined System consistently provided more responsive service to customers than the Baseline System. Further, the Refined System was found to function equally well under peacetime and mobilization scenarios.

In addition to providing more responsive customer service, the Refined System should decrease the depot-to-customer pipeline inventory by $32 million. Assuming an inventory holding cost rate of 10 percent, the one-time savings in pipeline inventory would be accompanied by a $3.2 million annual savings in inventory holding costs.

F. SPECIAL DODMDS ANALYSES

1. Nominal Depot Concept. Nominal depot variable costs contained state-of-the-art engineered costs for "hands-on" receipt, storage and issue operations. Analysis was confined to the Refined System structure, i.e., depot fixed costs and transportation costs were held constant. Potential systemwide

Scenario	Structure	Capacity
1	No Change	Adequate
2	No Change	Adequate
3	Two Clusters, Pueblo & Lexington, opened due to significance of transportation savings through serving local region customers	Excess
4	No Change	Adequate
5	No Change	Adequate
6	No Change	Adequate
7	No Change	Excess
8	No Change	Adequate
9	Two clusters, Pueblo and Lexington, opened due to very slim margin of trade-off between fixed costs and transportation costs for these two clusters	Excess
10	No Change	Adequate

Figure 12. SENSITIVITY ANALYSIS

annual savings, when compared to the Refined System costs, ranged from $32 million to $73 million and would require one-time capital investments of $1.1 billion and $3.2 billion respectively. With the volume of business and low item turnover experienced in the DODMDS, a large scale investment program in distribution system facilities, even under ideal conditions, did not appear to produce an attractive return on investment.

2. Separate Systems For Distribution of Consumables and Reparables. Analysis showed that a separate consumable item system would produce a net increase in system cost. Integrated stockage and processing of consumables and reparables in existing facilities was found to be more economical than separate stockage for consumable items at a few super-depots.

G. INTRACLUSTER ANALYSIS

The cluster analysis described in paragraph C provided an overall system structure which could serve as the target system to be achieved by the DODMDS. The cluster analysis dealt with the DODMDS in terms of clusters of depots and determined the volume of each product group which should be processed by each cluster on an annual basis.

The purpose of option formulation was to present alternatives to achieve the long-range DODMDS structure by considering the potential contribution of each individual depot to that structure. The alternatives were formulated by considering various qualitative and quantitative characteristics of each of the individual depots within the clusters.

1. The following qualitative and quantitative characteristics of each depot were used (Chapter 6, Volume II, Technical Report, defines and describes their application):

a. Estimated annual savings in depot costs.

b. Estimated one-time costs of personnel dislocation.

c. Estimated one-time costs of relocating materiel.

d. Collocated customer interfaces:

(1) Operational units

(2) Depot maintenance

(3) Industrial plant equipment (IPE)

e. The condition of facilities was categorized as marginal, adequate or very good.

f. Special distribution missions:

(1) Consolidation/Containerization Point (CCP).

(2) Direct Commissary Support System (DICOMSS).

(3) Manifested Water Cargo (MWC).

g. Organic (DOD Operated) capabilities:

(1) Airlift capability in the form of an airport capable of serving C-5 aircraft.

(2) Military Airlift Command Aerial Port of Embarkation.

(3) Water port facilities capable of receiving deep-draft ships (30 feet or more water depth pier-side).

h. Annual throughput capacity measured in lines and CWT.

i. Storage capacity measured in available cubic feet.

2. For option formulation based on the study firdings, individual clusters were grouped into four categories: (a) those where more than one viable option existed; (b) clusters proposed for substantial increases in workload, (c) those where the changes from the Baseline System were not significant; and (d) clusters proposed for discontinuation of their wholesale distribution mission. Refer to Chapter 6, Volume II, Technical Report, for detailed discussion on the different options.

a. Clusters Where More Than One Viable Option Exists:

(1) NORTHERN CALIFORNIA

FACILITIES. Sacramento Army Depot (SAAD); Sharpe Army Depot (SHAD); Naval Air Station Alameda (NASAL); Naval Supply Center Oakland (NSCOAK); Sacramento Air Logistics Center (SMALC); and Defense Depot Tracy (DDTC).

DISCUSSION. There is excess capacity in this cluster compared with the proposed workload in the Refined System. This cluster has the largest number of depots of any cluster; four of them have distinct local customer supply interfaces; three possess organic transportation capabilities; three have special distribution missions involving container stuffing; and there is considerable diversity in facility condition.

PREFERRED OPTION: Close SHAD and DDTC. This results in annual savings of $9.7 million, one-time costs of $22.7 million, and does not impact on local customer supply interface. This recommendation requires the absorption by the remaining depots of two special distribution missions (CCP and DICOMSS) in the cluster. As both the CCP and DICOMSS functions are in support of overseas activities, these functions should be established as close to a port as possible, i.e., NSCOAK. An alternative location for the CCP would be at SAAD. This would retain an Army mission at an Army depot. Management and administration of NAS Alameda and NSC Oakland should be merged. Closure of DDTC reduces the storage capability of the cluster but storage capacity at the remaining depots is adequate for the proposed system. There is no adverse impact on the proximity of wholesale stocks to organic airlift and water port capabilities in the cluster.

(2) UTAH

FACILITIES. Tooele Army Depot (TEAD); Ogden Air Logistics Center (OOALC); and Defense Depot Ogden (DDOU).

DISCUSSION. The Utah location was not transportation cost favorable for consumable product support of many of the customers assigned to it in the base year. The Utah cluster was comprised of three wholesale distribution facilities, two of which (OOALC and TEAD) also support depot maintenance and operational units.

PREFERRED OPTION: Close DDOU. This would provide an annual savings of $8.5 million, would incur one-time costs of $14.7 million, and would cause the least disruption in the supply interface between local customers and the wholesale depot activity. TEAD and OOALC workloads would increase over the base year but would not exceed the capacity (12.7 million CWT, 4.3 million lines, and 25.5 million cu ft) of existing facilities and handling equipment. Present local and regional customer oriented support would be retained.

(3) VIRGINIA

FACILITIES. Naval Air Station Norfolk (NASNOR); Naval Supply Center Norfolk (NSCNOR); Marine Corps Air Station Cherry Point (MCASCP); and Defense General Supply Center Richmond (DGSC).

DISCUSSION. The Refined System prescribed a cluster workload which was significantly less than the collective Baseline System capacity, indicating that potential savings were possible by elimination of the wholesale distribution mission at one or more of the four depots.

PREFERRED OPTION: Close DGSC. This option presents minimum disruption to supply interfaces with maintenance and operational units collocated with the wholesale supply activities. Annual savings of $5.8 million and one-time costs of $7.2 million would result. Management and administration of NASNOR and NSCNOR should be merged.

b. Clusters With Substantial Workload Increases:

(1) OKLAHOMA CITY

FACILITIES. Oklahoma City Air Logistics Center (OCALC).

DISCUSSION. The workload placed at Oklahoma City in the Refined System would be an increase of 19 percent over the upper bound (economic capacity limit) of where historical fixed costs were assumed to apply. Because of this condition it is possible that the historical fixed cost is an understatement of what would actually be required to handle the Refined System workload. It was estimated that the fixed cost for Oklahoma City would increase by $2.4 million. The physical capacity is adequate.

STUDY GROUP PROPOSAL: Substantially increase the workload at Oklahoma City.

(2) GEORGIA/FLORIDA

FACILITIES. Naval Air Station Jacksonville (NASJAX); Warner-Robins Air Logistics Center (WRALC); Marine Corps Logistics Support Base Atlantic (MCLSBLANT).

DISCUSSION. The workload placed at the Georgia/Florida cluster in the Refined System would be an increase of 43 percent over the upper bound (economic capacity limit) of where historical fixed costs were assumed to apply. As with Oklahoma City, the fixed cost could actually increase with such a large

increase in workload. This potential increase in fixed cost was estimated at $3.1 million. However, if the increase in fixed cost should be $5 million or more, DDMT (proposed for discontinuation of its wholesale distribution mission in paragraph d. below) would become a cost-favorable depot. A workload shift to DDMT from the Georgia/Florida cluster would incur a $7.1 million fixed cost at DDMT, but this would be offset by $2 million savings in transportation costs, yielding the $5 million break-even point in the trade-off between DDMT and Georgia/Florida. Whether or not any increase in fixed cost would occur in the Georgia/Florida cluster, and the level of such increase, must be determined by site-specific analysis of the actual impact of the Refined System workload on the operations of the depots in the Georgia/Florida cluster. The physical capacity is adequate.

STUDY GROUP PROPOSAL: Although a substantial increase in the workload for the Georgia/Florida cluster is indicated, a site-specific analysis is recommended to evaluate impact on fixed costs of the increase in workload over the base year. Additionally, the recommendation to discontinue the wholesale mission at DDMT should be deferred pending completion of the site-specific analysis in Georgia/Florida.

c. Clusters where changes from the Baseline System are not significant:

Refined System workload for the following clusters either increased or remained relatively unchanged when compared to the Baseline System. The throughput and storage capacity of each cluster permits processing the Refined System workload. All depots within these clusters retain a wholesale distribution mission, however as recommended in Chapter 7, Volume II, Technical Report, management and administration of NASNI and NSCSD should be merged.

(1) SOUTHERN CALIFORNIA includes Naval Air Station North Island (NASNI); Naval Supply Center San Diego (NSCSD); and Marine Corps Logistic Support Base Pacific (MCLSBPAC).

(2) PENNSYLVANIA includes Letterkenny Army Depot (LEAD); New Cumberland Army Depot (NCAD); Tobyhanna Army Depot (TOAD); and Defense Depot Mechanicsburg (DDMP).

(3) ANNISTON comprises Anniston Army Depot (ANAD).

(4) TEXAS includes Corpus Christi Army Depot (CCAD) and San Antonio Air Logistics Center (SAALC).

(5) RED RIVER comprises Red River Army Depot (RRAD).

(6) PEARL HARBOR comprises Naval Supply Center Pearl Harbor (NSCPH).

d. Clusters proposed for discontinuation of the wholesale distribution mission:

(1) OHIO comprising Defense Construction Supply Center Columbus (DCSC) and Defense Electronics Supply Center Dayton (DESC).

(2) LEXINGTON comprising Lexington Army Depot Activity (LBDA).

(3) PUEBLO comprising Pueblo Army Depot Activity (PUDA).

(4) MEMPHIS[1] comprising Defense Depot Memphis (DDMT)

3. Summary. The study group preferred options and proposals will provide realizable annual savings in depot fixed cost of $48.4 million. The one-time personnel termination/relocation and materiel relocation costs associated with these proposals are $59.6 million and $24.2 million respectively. (See Chapter 7, Volume II, Technical Report, for detailed discussion of recommendations.)

H. MILITARY CONSTRUCTION/INVESTMENT CONSIDERATIONS

While the DODMDS options proposed no investment, further savings and/or gains in productivity are potentially available through more site-specific analyses. Individual Services or DLA may elect to make additional investments to upgrade and extend the life expectancy of some facilities. This study

[1]Closure should be deferred pending detailed on-site analysis at Georgia/Florida cluster depots.

does not propose to offer the total savings or maximum gains in productivity available. Therefore, for each facility proposed for inclusion in the future DODMDS structure, it is recommmended that each Service and DLA conduct a more detailed site-specific analysis once the options are selected by senior decision makers. These analyses may result in investment proposals to increase cost savings and productivity on a location-by-location basis as well as recommend renovations for facilities which are judged to have satisfactory potential for long term use.

I. DODMDS-RELATED CONSIDERATIONS

1. Maintenance. During the course of the study, some additional considerations became apparent which were on the periphery of the study effort. One was the obviously significant role of maintenance in influencing distribution facility location. The study group was not chartered to examine the potential realignment of maintenance missions and thus maintenance facilities were excluded from analyses other than in their significant role as suppliers and customers. Their role tends to pull distribution missions as a function toward the locations of depot maintenance facilities. The fact that the DODMDS charter did not include realignment of depot maintenance missions should not be construed as a shortcoming of the DODMDS study. Separate analyses of drastic shifts in the locations of suppliers and of consumers showed little impact of such shifts on the structure of the recommended DODMDS. Further, specific analysis of hypothetical maintenance shifts had no significant effect on the proposed system. If consolidation of depot maintenance missions occurs, it will be a relatively straightforward task to make the required adjustments to the distribution system. The current DODMDS models, off-line analytical techniques, and the DODMDS data base can be used for this purpose.

2. Management. Another important consideration was management of those facilities which remained. This subject was a major concern in the earlier phases of the study when the full spectrum of possible structural alternatives was considered. However, the proposed system structure appears to fall in line with present management channels. Interservice support and joint stockage are not new concepts. These practices have been in effect for some time and have been one of the reasons for the growth of the Military Standard Systems

which provide for the interchange of essential data elements. Clearly, some revisions to channels of communication among ICP's, technical managers and customers could be required and some changes to existing management information systems (MIS) could result. However, the structural changes proposed do not require major revisions in management and none are recommended.

J. SUMMARY

The proposed DODMDS of the future thus points to a system of 25 distribution facilities which will actually become 22 separate activities with the merger of three collocated Naval Air Stations and Naval Supply Centers. This revised system structure will be capable of satisfying both peacetime and mobilization/wartime requirements. This will require a reallocation of some resources between the Services/DLA. A system with this structure can reduce operating costs by almost $100 million annually within four years (expressed in constant FY 75 dollars). Several other options are possible in some clusters. Nevertheless, the recommended DODMDS involves least disruption to the customer support patterns which existed within the clusters and provides a more cost effective system.

Chapter 5

IMPLEMENTATION PLANNING

CHAPTER 5

IMPLEMENTATION PLANNING

A. INTRODUCTION

The system structure proposed in the preceding chapter involves a series of specific time-phased actions to transition from the current DODMDS structure of 34 facilities to 25 facilities. In addition, the three Navy consolidations will reduce the wholesale distribution activities to 22. These implementing actions have been stratified into three phases due to the requirements imposed by Public Law and several key directives (see Chapter 8, Volume II, Technical Report).

B. PHASE I (1 APRIL - 31 JULY 1978)

1. Staffing by JLC/DLA staffs.

2. Conduct site-specific analysis of depots in Georgia/Florida cluster.

3. In-house feasibility studies where impact appears likely.

4. OSD staffing including coordination with Services/DLA for selection of primary and secondary candidates.

5. Joint Steering Group formed by OSD.

C. PHASE II (1 AUGUST 1978 - 28 FEBRUARY 1979)

1. SECDEF public announcement of candidates for realignment.

2. Numerous impact assessments and studies conducted by the Services/DLA.

3. Services/DLA submit formal recommendations for OSD staffing and SECDEF approval.

D. PHASE III (1 MARCH 1979 - 31 JULY 1982)

1. SECDEF decision announcement.

2. Services/DLA submit budget proposals.

3. Congressional review where required.

4. Office of Economic Adjustment (OEA) establishes contact with communities involved.

5. Services/DLA develop appropriate policy and procedures and issue General Orders as required.

6. Redistribute or dispose of excess real and personal property.

7. System resources and commodities are gradually realigned.

EPILOGUE

EPILOGUE

Further Savings Through Improved Productivity

One rather pessimistic assumption was that there were no existing potential savings within depots, *in situ*, simply through more effective management of existing facilities. If a 10 percent efficiency increase were possible, an additional potential reduction would be in the range of $30,000,000 annually (10 percent of current variable cost, systemwide). As one distribution expert, Dr Donald Bowersox of Michigan State University, put it recently:

> "....In the past, we have overpowered our productivity problems associated with growth and complexity by applying new technology. This does not appear to be a viable course of action for the future.
>
> "The key to overcoming the productivity gap is managerial innovation. Several sound concepts currently exist and can be implemented within today's technological capacity if management can foster operational and institutional change.
>
> "While many legal and/or regulatory barriers exist to hinder innovative change, the most serious problem is management attitude and inflexibility....."[1]

It is difficult to quantify potential productivity savings, but they are definitely additive to those already described and, in most cases can be attained *without* investments in new facilities.

To reiterate, the study's finding that the proposed system would have adequate capacity for storage and processing is *not* a recommendation against subsequent investments which will yield higher productivity in any given location -- quite the opposite. Once the general DODMDS structure is agreed upon it should be possible to evaluate any investment proposals with respect to their total contribution to the individual Services' and DOD goals.

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[1] Donald J. Bowersox, "The Need for Innovative Distribution Management", *Distribution Worldwide*, December 1977, pg. 30.

APPENDICES

72 DODMDS PRODUCT GROUPS

DODMDS Product Group Number	Generic Commodity Group/ Product Group Description
	Weapons and Fire Control
101	Small Arms
102	Guns Over 75mm & Major Components
104	Arms and Fire Control - Parts
121	Fire Control - Reparables
	Ammunition and Nuclear Ordnance*
111	Nuclear Items
131	Ammunition - Small
132	Ammunition - Large
	Missiles
141	Missile - Reparables - Small
142	Missile - Reparables - Large
144	Missile Parts - Small
145	Missile Parts - Large
	Aircraft Equipment and Materiel
151	Fixed Wing - Reparables
152	Rotary Wing - Reparables
153	Structural Components - Reparables
154	Aircraft Structural Parts - Consumables - Medium
155	Aircraft Structural Parts - Consumables - Large
156	Aircraft Structural Parts - Consumables - Small
157	Aircraft Structural Parts - Consumables - Small
161	Aircraft Engines & Major Components - Small
162	Aircraft Engines & Major Components - Large
171	Ground Support Equipment - Reparables
174	Ground Support Equipment - Consumables
	Ships & Boats and Equipment
191	Ships & Boats
204	Ships & Boats Equipment

*Product groups 111, 131 and 132 were excluded from the study.

DODMDS Product Group Number	Generic Commodity Group/ Product Group Description
	Tank Automotive Equipment and Materiel
221	Railway Equipment - Reparables
224	Railway Materiel - Consumables
231	Wheeled Vehicles
232	Combat Tracked Vehicles
241	Tractors & Construction Equipment - Large
244	Tractors & Construction Equipment - Small
264	Tires & Tubes Non-Aircraft
265	Tires & Tubes Aircraft
281	Engines & Reparable Components
294	Misc. Auto Parts & Components - Medium
295	Misc. Auto Parts & Components - Large
296	Misc. Auto Parts & Components - Small
297	Misc. Auto Parts & Components - Small
	Maintenance and Industrial Equipment
491	Shop Equipment & Industrial Machines - Rep - Sm/Med
492	Shop Equipment & Industrial Machines - Rep - Large
494	Misc. Shop & Industrial Items - Consumables - Medium
495	Misc. Shop & Industrial Items - Consumables - Large
496	Misc. Shop & Industrial Items - Consumables - Small
497	Misc. Shop & Industrial Items - Consumables - Small
	Common Hardware
534	Hardware & Related Items - Medium/Large
536	Hardware & Related Items - Small
537	Hardware & Related Items - Small
	Construction Materiels
544	Construction Materiels - Small
545	Construction Materiels - Large
	Electronics, Optical Equipment & Materiels
581	Communications Electronics - Reparable
584	Communications Electronics - Other - Medium
586	Communications Electronics - Other - Small
587	Communications Electronics - Other - Small
611	Electrical Power Equipment - Reparable
614	Misc. Electrical Equipment - Other - Medium
616	Misc. Electrical Equipment - Other - Small
617	Misc. Electrical Equipment - Other - Small
615	Batteries, Fuel Cells, etc.
671	Photo Equipment
674	Photo Supplies

DODMDS Product Group Number	Generic Commodity Group/ Product Group Description
	Medical
651	Medical Equipment
654	Misc. Medical Equipment & Supplies - Small
655	Misc. Medical Equipment & Supplies - Large
	Chemicals, Paints, Petroleum Products
684	Chemicals, Paints, Petrol Products - Small
685	Chemicals, Paints, Petrol Products - Large
	House & Office Supplies & Equipment
714	House & Office Equipment - Small
715	House & Office Equipment - Large
	Clothing & Textiles
844	Clothing & Textiles - Small
845	Clothing & Textiles - Large
	Subsistence
894	Subsistence
895	DICOMSS
	Other Miscellaneous/Minor Items
994	Miscellaneous - Small
995	Miscellaneous - Large

27 DODMDS PRODUCT BUNDLES

Bundle Number	Bundle Name	Product Number*
1	Guns & Fire Control	101 102 104 121
2	Missile	141 142 144 145
3	Aircraft	151 152
4	Aircraft Reparables	153 171
5	Aircraft Engines	161 162
6	Aircraft Parts	154 155 156 157 174 265
7	Ships & Boats	191 204
8	Tracked Vehicles & Railroad Equipment	221 224 232
9	Wheeled Vehicles	231
10	Automotive Engines	281

* See Appendix A for description of each product.

Bundle Number	Bundle Name	Product Number
11	Automotive Parts	264 294 295 296 297
12	Construction Equipment	241 244
13	Shop Equipment	491 492 495
14	Shop Consumables	494 496 497
15	Hardware	534 536 537
16	Electronics Equipment	581
17	Electrical Equipment	611
18	Photo Equipment & Supplies	671 674
19	Communications Parts	584 586 587
20	Electrical Consumables	614 615 616 617
21	Medical	651 654 655
22	Construction Materiel	544 545

Bundle Number	Bundle Name	Product Number
23	Office Supplies	714 715
24	Miscellaneous	994 995
25	Chemicals	684 685
26	Clothing & Textiles	844 845
27	Subsistence & DICOMSS	894 895

15 DEPOT CLUSTERS

Cluster Number	Depot Name	Cluster Number	Depot Name
1	Sacramento AD	6	Lexington*
	Sharpe AD		
	NAS Alameda	7	Anniston AD
	NSC Oakland		
	Sacramento ALC	8	NAS Jacksonville
	DDTC Tracy		Warner Robins ALC
			MCLSBLANT Albany
2	NAS North Island		
	NSC San Diego	9	Corpus Christi AD
	MCLSBPAC Barstow		San Antonio ALC
3	NAS Norfolk	10	Red River AD
	NSC Norfolk		
	MCAS Cherry Point	11	Pueblo*
	DGSC Richmond		
		12	NSC Pearl Harbor
4	Letterkenny AD		
	New Cumberland AD	13	DDMT Memphis
	Tobyhanna AD		
	DDMP Mechanicsburg	14	Oklahoma City ALC
5	Tooele AD	15	DCSC Columbus
	Ogden ALC		DESC Dayton
	DDOU Ogden		

* Depot Activity

DODMDS WARTIME WORKLOAD FACTORS

DODMDS Product Group Number*	Factor
101	3.0
102	4.5
104	3.4
111, 131, 132	(Not modeled)
121	2.2
141, 142, 144, 145	3.4
151, 152	2.5
153	2.3
154, 155, 156, 157, 161, 162	2.6
171, 174	2.0
191	2.5
204	6.7
221	2.8
224	2.5
231, 232	2.0
241, 244	2.5
264, 265	2.0
281,	4.5
294, 295, 296, 297	3.4
491, 492, 494, 495, 496, 497	2.8
534, 536, 537	2.4
544, 545	4.7
581, 584, 586, 587	5.3
611, 614, 616, 617	3.0
615	6.3
671	4.6
674	6.0
651, 654, 655	8.7
684, 685	3.2
714, 715	2.5
844, 845	2.5
894, 895	2.5
994, 995	2.0

* See Appendix A for description of product group numbers.